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International Earth Science Constellation

Mission Operations Working Group

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Constellation Coordination System (CCS) Status

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Agenda

- CCS Purpose and Goals
- CCS Security
- CCS 7.3
- CCS 7.4+

CCS Purpose

- System for coordinating and monitoring Constellation safety of the Earth Sciences Constellation (ESC) missions and is a central source of data sharing and operational planning
 - Primary tool for monitoring the Constellation configurations
 - Enables information exchange among/between domestic and international partner ESC missions, including access to nominal predicted mission ephemerides
 - Transfer critical product data between the Mission Operation Centers (MOCs), CARA, and other authorized mission users
 - Mission Analysis tools and automated health and safety monitoring
 - Automated constellation safety warning notifications
 - Graphical visualization of orbital data
- The latest release, CCS 7.2, was deployed to operations in late August 2016

CCS in the Future

- The long term goals for CCS are:
 - Enhance CCS capabilities as an online tool that performs flight dynamics analyses relevant to the Morning/Afternoon Constellations
 - Will be accomplished by targeting improvements to CCS in future releases to contain functionality that users have asked for and by soliciting user feedback more frequently
 - Make CCS more secure to better protect each mission's data
 - Will be accomplished through the use of RSA token for two-factor authentication for user login to the website, and by implementing password complexity and password cycling changes

CCS Security Enhancements

Security Enhancement	Schedule (approximate)	Plan
Annual password changes for mission accounts on the CCS FTP servers to comply with NASA password complexity requirements (12 characters, requiring lower and upper case letters, numbers, and special characters)	Fall 2016 Winter 2017	Have begun working with missions one at a time. Will be communicated in advance of changes. New passwords to be provided to missions through secure NASA NOMAD file transfer service
Use of RSA tokens for two-factor authentication for logging into the website	Winter 2017	Initial testing began in Summer 2016. Tokens will be mailed to all users and configured in advance of going operational. Instructions will be provided to users unfamiliar with RSA tokens.
Migration of CCS servers to a virtual machine (VM) environment	January 2017 (with CCS 7.3)	Moving CCS software off of aging physical servers. Combining the CCS website and content servers into a single server to simplify infrastructure. Our approach will limit impacts on established mission interfaces with CCS
Periodic password changes for user accounts on the website	January 2017	Periodic website password changes is a feature of CCS 7.3

Overview of CCS 7.3

- CCS 7.3 has three main categories of new features:
 - Development of the “arbitrary ephemeris” capability, which will allow the user to upload an ephemeris or NORAD TLE for use in the CCS Tools
 - Security improvements, necessary to address recent findings from web vulnerability scans
 - Modification of the existing control box visualization on the CCS Home page to improve the display of the missions and their relation to the control boxes

Arbitrary Ephemeris / Mission Feature

- CCS Tools, excluding the Satellite Situational Awareness tool, will provide the capability for the user to upload any ephemeris or NORAD TLE in a CCS-supported format as an input to the tool
- The uploaded file can be associated with a “user-defined” mission, or with an existing CCS mission
- Tools which use input values that exist in a CCS-defined mission’s Mission Definition will pre-populate the values. Those inputs will be prompted for when a “user-defined” mission is selected
- All CCS users who have received a shared Saved Analysis will be able to access the data associated with any “user-defined” missions in that run
- CCS users without any mission access will be able to use CCS Tools

Approach for the use of NORAD TLEs

- When a NORAD TLE is chosen as the reference input in a Tool, the option to “Use ephemeris points” will not be available since it is not applicable to NORAD TLEs
- When a NORAD TLE file is used as an input for a tool, the TLE is propagated using a NORAD propagator, and a CCSDS OEM file with a 60-second step size will be created
- An input NORAD TLE must have at least one state within 7 days of the analysis time span
- If an input NORAD TLE contains multiple TLE states, the state with the closest epoch is used for each propagation step
- The generated CCSDS OEM file is used in the analysis, and is available for download on the Results page

Account and Data Security

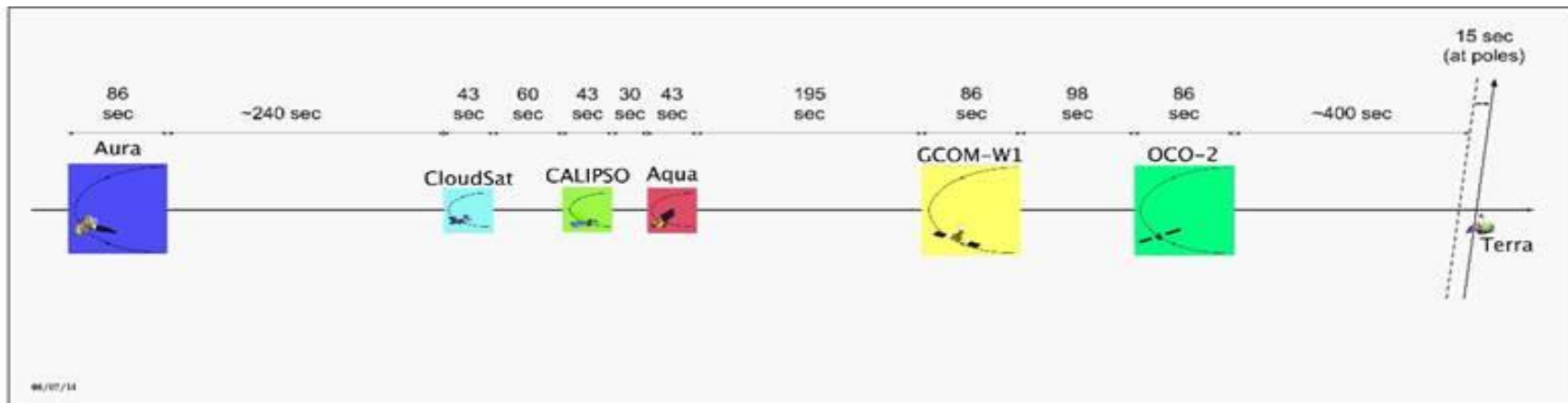
- The overall system and security posture of CCS will be improved through the implementation of several new features and bug fixes, including:
 - Account passwords will be selected by the user upon registration
 - Account passwords will expire after a set period of time
 - Account passwords will need to meet a minimum set of complexity requirements, similar to current NASA NDC requirements
 - Password reset and account unlocking will not require interaction from the CCS Support team, but the option remains available for time-sensitive circumstances
 - Web application framework and associated components will be upgraded to the latest version to mitigate known security threats
 - Content URLs will be modified to stream data, including movies and reports, to the browser

CCS System Virtualization

- The CCS servers in the EOC, BEOC and BEOC Test environment are currently being migrated to virtualized environments.
 - This virtualization includes the consolidation of some of the CCS servers, which requires changes to the CCS software that will be performed as part of the CCS 7.3 release.
- The new hardware will provide for enhanced system performance and efficiencies will gained by removing redundant systems.

Control Box Visualization Modification

- The current control box visualization on the CCS Home Page will be modified to more closely resemble the concept image below:
 - Emphasize phasing separation by adjusting the existing plot dimensions
 - Emphasize the current and predicted future locations of the missions with respect to their control boxes
 - Emphasize the Semi Major Axis for each mission relative to the ideal value



Other Enhancements (1 of 2)

- The following other minor enhancements are included in this release:
 - The Mean Local Time at the Nodes tool will allow the input of one or more ephemerides from any mission. In CCS 7.2, one trend ephemeris and one normal ephemeris per mission are required
 - Any CCS-supported ephemeris format or NORAD TLE can be used in any of the CCS Tools. In CCS 7.2, this is restricted to formats supported natively in FreeFlyer (STK 3, STK 8, FreeFlyer, CCSDS OEM, GSFC Code 500)
 - Any CCS-supported ephemeris format can be used in Conversion Rules, Merge Rules and Trend Rules. In CCS 7.2, the same format restrictions for the Tools also applies to Product Rules
 - User accounts will automatically unlock 15 minutes after being locked. The option for the CCS Support Team to manually unlock will remain for time-sensitive circumstances

Other Enhancements (2 of 2)

- The following other minor enhancements are included in this release:
 - Mission Administrators will be able to view the full name and contact information for all users who have access to their mission
 - The ability to select a different ephemeris on a CCS Tool's Input page will be more obvious
 - All forms on the CCS website will contain a "Reset" button
 - All emails sent by CCS will contain a link to the CCS website

CCS 7.3 Schedule

- The following is the tentative CCS 7.3 schedule:
 - Code Development is currently in progress
 - Factory Acceptance Testing (FAT) in November and December 2016
 - Site Acceptance Testing (SAT) in December 2016 and January 2017
 - Promote to EOC and BEOC in January 2017

CCS 7.4+

- Some major enhancements being considered for future CCS releases are:
 - Ability for users to define their own homepage, including user-defined automated analyses
 - Automatic ephemeris selection when running a manual analysis where CCS chooses the most recent applicable ephemeris
 - Automated Phasing at the Poles analysis and update the tool to compare any number of missions
 - Include any new user-requested plots
 - Integrate new capabilities gained from the CVT project
 - Improvements in the speed of the website
- Any other suggestions?

Questions?

- Thank you for your continued support!
- For all CCS communications please contact:
CCS_Support@ai-solutions.com